TABLE 6-continued

Cb vs Ti Nominal (%): Fe—0.5% Cb—0.7% Mn—0.5% Si—0.3% Al—0.005% B							
	% Other Elements				Time to 1% Creep (Hours)		
Alloy	Ni	Cr	C	N	1400° F./13 ksi	1600° F./7 ksi	1800° F./2.5 ksi
V	39.8	30.0	.07	.16	77	40	274

TABLE 7

	COMPARATIVE PROPERTIES (Sheet)						
	Alloy I	Alloy V	800H	253MA	601	310	316
Yield Strength (ksi)							
RT	41	49	35	51	42	32	38
1,200° F.	26	27	22	24	38	17	21
1,400° F.	24	28	20	22	39	15	18
1,600° F.	20	25	13	16	16	12	11
1,800° F.	11	10	8	—	9	6	6
Tensile Elongation (%)							
RT	42	45	46	51	47	46	—
1,200° F.	42	50	45	48	50	39	—
1,400° F.	45	40	62	44	41	73	—
1,600° F.	61	35	56	—	65	69	—
1,800° F.	56	66	83	—	86	54	—

TABLE 8

COMPARATIVE PROPERTIES (Sheet) Room Temperature Properties After 1,000 Hours at Temperature						
Exposure Temperature		Alloy I	Alloy V	800H	601	310
1,200° F.	UTS	98	116	88	127	86
	YS	41	57	38	76	37
	EL	35	30	38	31	41
1,400° F.	UTS	94	121	83	106	100
	YS	39	62	34	51	41
	EL	32	24	41	37	21
1,600° F.	UTS	90	108	78	91	84
	YS	35	48	30	38	35
	EL	33	32	39	45	23
As Annealed	UTS	99	108	82	95	81
	YS	41	49	36	42	32
	EL	42	45	46	47	46

TABLE 9

	COMPARATIVE PROPERTIES (Sheet)						
	ALLOY I	ALLOY V	800H	253MA	601	310	316
Stress Rupture Life (Hours)							
1,400° F./13 ksi	949	551	104	110	205	10	95
1,660° F./7 ksi	196	194	88	40	98	5	21
Creep Life (Hours to 1%)							
1,400° F./13 ksi	92	77	3	18	46	1	—
1,600° F./7 ksi	25	40	8	10	29	1	—

From the data discussed above, we have found that an alloy comprised of 25 to 45% nickel, about 12% to 32% chromium, at least one of 0.1% to 2.0% columbium, 0.2% to 4.0% tantalum and 0.05% to 1.0% vanadium, up to about 0.20% carbon, and about 0.05% to 0.50% nitrogen with the balance being iron plus impurities has good hot workability and fabricability characteristics provided $(C+N)_F$ is greater than 0.14% and less than 0.29%. As previously stated $(C+N)_F=C+N-Cb/9$. In versions of the alloy wherein vanadium and tantalum are substituted separately or in combination for all or part of the columbium $(C+N)_F$ is defined by C+N

$$-\frac{Cb}{9}-\frac{V}{4.5}-\frac{Ta}{18}.$$

Silicon may be added to the alloy but preferably it does not exceed 3% by weight. Up to 1% silicon has excellent strength while 1% to 3% silicon has lower strength but better oxidation resistance. Titanium may also be added to improve creep resistance. However, not more than 0.20% titanium should be used. Manganese and aluminum may be added basically to enhance environment resistance, but should generally be limited to less than 2.0% and 1.0% respectively.

Boron, molybdenu, tungsten and cobalt may be added in moderate amounts to further enhance strength at elevated temperatures. Boron content of up to 0.02% will improve creep strength, but higher levels will impair weldability markedly. Molybdenum and tungsten will provide additional strength without significant thermal stability debit up to about 5%. Higher levels will produce some measurable loss in thermal stability, but can provide significant further strengthening up to a combined content of about 12%.

While we have decribed certain present preferred embodiments of our invention, it is to be distinctly understood that the invention is not limited thereto but may be variously embodied within the scope of the following claim.

We claim:

1. A metal alloy comprised of, in weight percent, about 30% to 45% nickel, about 12% to 32% chromium, at least one of 0.1% to 2.0% columbium, 0.2% to 4.0% tantalum and 0.05% to 1.0% vanadium, up to about 0.20% carbon, about 0.05% to 0.50% nitrogen, an effective addition of titanium up to 0.20% to provide beneficial strengthening effects at elevated temperatures, and the balance being iron plus impurities and wherein $(C+N)_F$ is greater than 0.14% and less than 0.29% $(C+N)_F$ being defined as

$$(C+N)_F = C+N-\frac{Cb}{9}-\frac{V}{4.5}-\frac{Ta}{18}.$$

2. The alloy of claim 1 further including at least one of up to 1% aluminum, up to 3% silicon, up to 2% magnagese, up to 5% cobalt, up to 5% total molybdenum and tungsten, up to 0.2% boron, up to 0.2% zironcium, and up to 0.1% total yttrium, lanthanum, cerium and other rare earth metals.